AN ILLUSTRATED SYNOPSIS OF THE FISHES OF THE FAMILY SCIAENIDAE OF INDIA

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ABSTRACT

The paper gives brief descriptions of 36 species of sciaenids found in Indian waters, along with a key for identification. Thirty species are illustrated.

INTRODUCTION

Sciaenid fishes form one of the important constituents of the demersal-fish landings of India, forming about 6% of the total marine fish landings. While the larger sciaenids like *Protonibea diacanfhes* and *Otolithoides biaurites* which, attaining more than a meter in length, are commercially important, occurring in large shoals in the north-west coast, smaller sciaenids form a seasonal fishery of varying magnitude along the entire coast of India.

Though many works are available on the sciaenids, considerable amount of ambiguity exists in the identification of these fishes. The present work is an attempt to help the fishery workers in easy identification of the species.

BRIEF DESCRIPTION OF THE SCIAENIDS

1. *Umbrina sinuata* Day

Head 32-39% of S.L., anal spine 11-14% of S.L., number of soft dorsal rays 26-28; gas bladder simple without arborescent tubules; mental barbel with a median pore at its tip. Sagitta with the tail bent sharply. Teeth uniform band on lower jaw. Body with dark stripes. Distribution: from east coast of Africa to Karachi.

2. *Bahaba chaptis* (Hamilton)

Head 27% of S.L., anal spine 10% of S.L., number of soft rays 24-25; gas bladder with an anterior unbranched tubule extending backward; sagitta with enlarged anterior depression and posterior curved groove; lower jaw with an outer row of minute teeth and an inner row of villiform teeth; first dorsal, black distally, second dorsal and caudal with narrow black streak. Eastuaries of Sittang and Ganges.

3. *Macrospinosa cuja* (Hamilton) (Fig. 1)

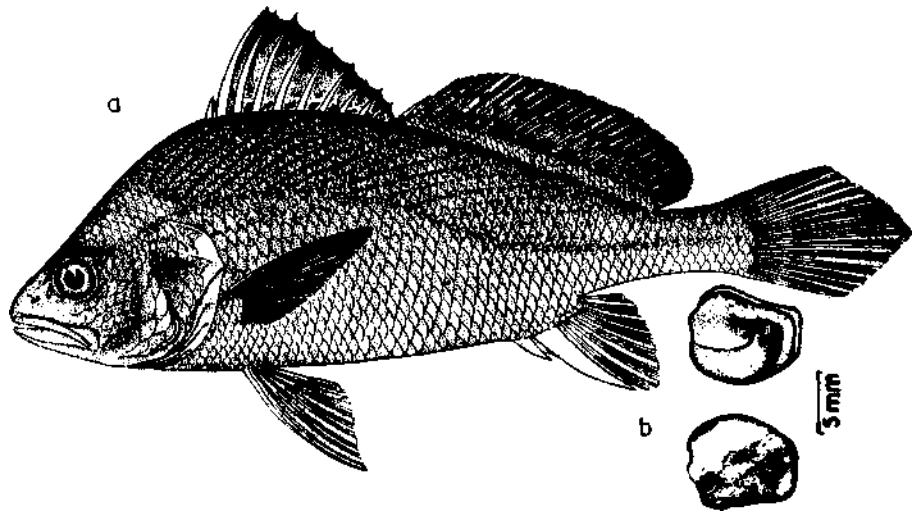


FIG 1. (a) *Macrospinosa cuja* (Hamilton); (b) sagitta.

Head 30-31% of S.L., second anal spine very strong 16-19% of S.L., second dorsal rays 28-29; gas bladder with two pairs of minute tubules at the anterior end; mental pores, five; sagitta broad and thick with well-curved 'tail'; teeth well differentiated in both jaws; large black spots on the dorsal fins; body dorsally with rows of spots; forms a fishery in the estuaries of Ganges.

4. *Kathala axillaris* (Cuvier) (Fig. 2)

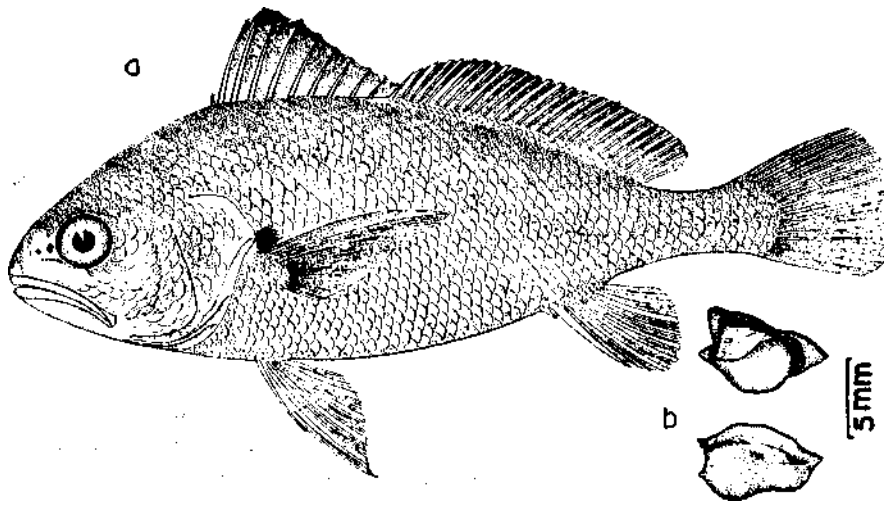


FIG. 2. (a) *Kathala axillaris* (Cuvier); T.L. 150 mm; (b) sagitta.

Head length 31-36%; second anal spine 11-14% of S.L.; second dorsal rays 26-29; gas bladder with a short, curved born-like tubule on each side anteriorly; mental pores, five; sagitta pointed anteriorily with a shallow anterior depression; teeth slightly differentiated in lower jaw; a large blotch on axilla, first dorsal with a dark grey blotch. India, Sri Lanka, Indo-China, South China, Java, New Guinea.

5. *Otolithoides biaurites* (Cantor) (Fig. 3)

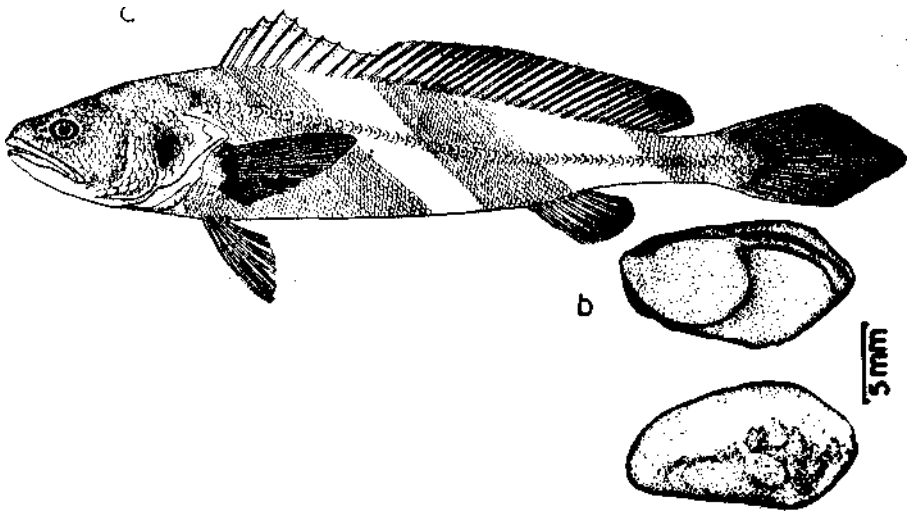
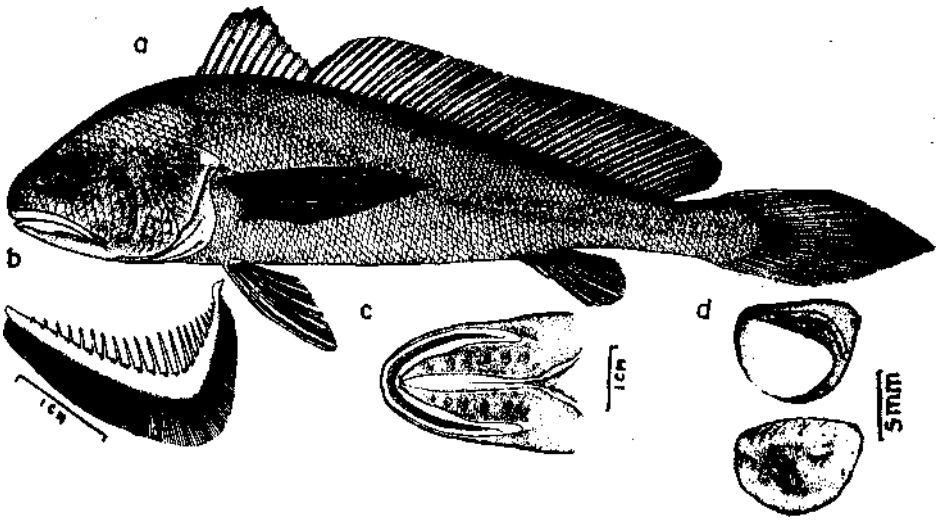


FIG. 3 (a) *Otolithoides biaurites* (Cantor), T.L. 240 mm; (b) s.igitta

Head 27-29%; second anal spine 6-5% of S.L.; second dorsal fin rays 28-29; gas bladder with a pair of long tubular appendages originating from posterior end and extending into the head giving short branches; sagitta elongated and thin; lower jaw with three mental pores, teeth well differentiated in both jaws; first dorsal grey, opercle with a grey blotch. India, Burma, Malay Peninsula, Somalia, Borneo, Indo-China, Arnam.

6. *Otolithoides pama* (Hamilton) (Fig. 4)

Head length 28-34%; second anal spine 3-4% of S.L.; second dorsal fin rays 40-44; gas bladder carrot-shaped with a pair of tubules originating near the posterior end extending forward into the head ramifying as branches below ear ossicles; sagitta elongate with shallow anterior and posterior depressions; lower jaw with two pairs of mental pores; teeth on lower jaw well differentiated; tip of first dorsal grey, opercle with a grey blotch. Karachi, north-east coast of India, estuaries of Ganges and Brahmaputra, Malay Peninsula, Sumatra, New Guinea.



PIG. 4. (a) *Otolithoides pama* (Hamilton), T.L. 180 mm; (b) gill arch; (c) ventral view of head; (d) sagitta.

7. *Parma microdon* (Sleeker) (Fig. 5)

Head 25-36%; second anal spine length 6-8% of S.L.; second dorsal rays 31-35; gas bladder with an anterior tubule on each side which bifurcates into a branched anterior appendage and an unbranched posterior tube; sagitta

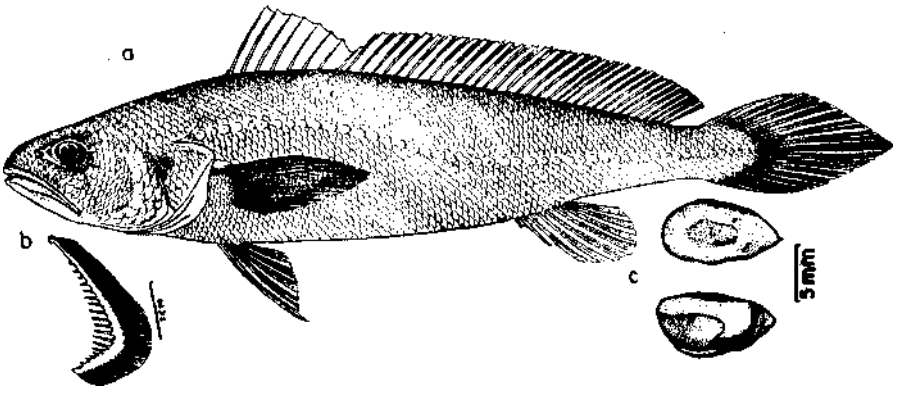


FIG. 5 (a) *Pamia microdon* (Bleeker), T. L. 205 mm; (b) gill arch; (c) sagitta.

narrow, elongated, anterior depression pear shaped, the posterior depression deep; lower jaw with three pairs of mental pores; upper jaw with canines; lower jaw with enlarged teeth; two-third of spinous dorsal black; opercle with a blue spot. India, Burma, Malay Peninsula , Sumatra, Borneo and Vietnam.

8: *Permahia macrophthalmus* (Bleeker) (Fig. 6)

Head 30-36%; second anal spine 6-10% of S.L.; mouth terminal; second dorsal rayfs 21-26; gas bladder round anteriorly with 15-20 well-developed, arborescent tubules with no ventral limb; sagitta oblong with indistinct anterior

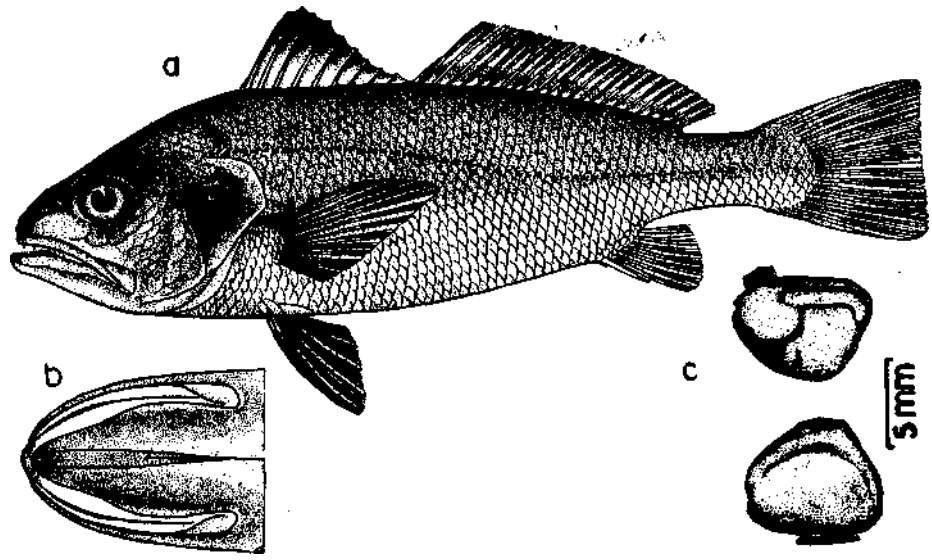


FIG. 6 '(a) *Pennahia macrophthalmus* (Bleeker), T..L. 162 mm; (b) ventral view of head; (c) sagitta

depression, marginal groove deep; lower jaw with two pairs of minute mental pores; teeth on both jaws well differentiated, inner row of lower-jaw teeth enlarged, caudal fin truncate; opercle with a steel blue blotch; pectoral axilla with a black blotch. Karachi to Chinese coast.

9. *Argyrosomus hololepidotus* (Lacepede)

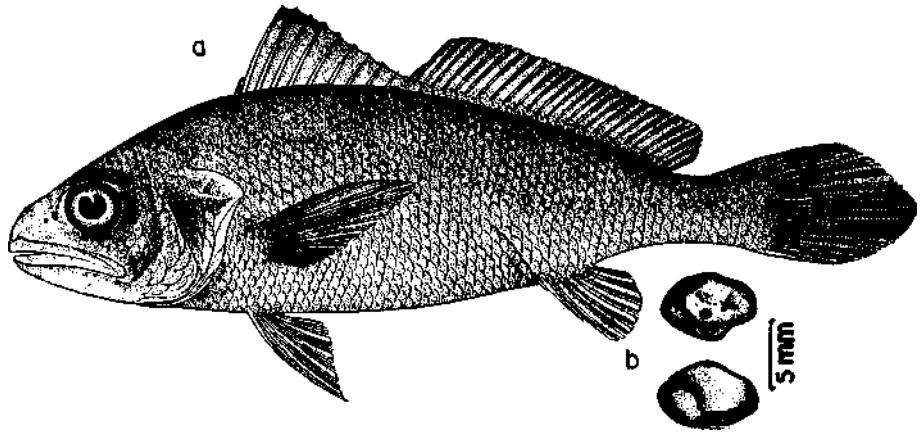
Head length 28-34%; second anal spine 6-9% of S.L.; dorsal rays 26-29; gas bladder with 25-35 arborescent tubules; sagitta elongated with pouched 'head' and J-shaped 'tail'; mental pores three pairs; teeth differentiated in both jaws; spinous dorsal dusky and the caudal with dark margin. West Africa, Cape of Good Hope to Natal, Madagascar, Kathiawar (India), Australia.

10. *Argyrosomus amoyensis* (Bleeker)

Head length 29%; second anal spine 7% of S.L.; dorsal rays 27; gas bladder with 22 pairs of arborescent tubules, mental pores three pairs; mouth terminal; faint oblique stripes dorsally, spinous dorsal dark distally. Amoy, Bombay, Gwadur.

11. *Atrobucca nibe* (Jordan and Thompson) (Fig. 7)

Head length 32-35%; second anal spine length 11-14% of S.L.; gas bladder anteriorly round with 25-28 well-developed lateral tubules with dorsal and ventral limbs ramifying profusely. Sagitta oblong with indistinct anterior



PIG. 7. (a) *Atrobucca nibe* (Jordan & Thompson), T.L. 160 mm; (b) sagitta.

depression and distinct posterior groove; lower jaw with three pairs of mental pores; teeth well differentiated in both jaws; mouth terminal; length of gill filament 36-42% of eye; caudal fin cunate; upper edge of first and second dorsal fin grey. East China Sea, Korea, Taiwan, Bay of Bengal.

12. *Atrobucca trewavasae* Talwar and Sathiarajan

Head length 38-40%; second dorsal anteriorly round with 26 pairs of highly ramifying tubules with dorsal and ventral limbs; sagitta oblong with indistinct anterior depression and deep posterior groove; teeth well differentiated in both jaws; mouth terminal; length of gill filament 71-90% of eye length; caudal cunate. Deep sea off Madras, 250 meters.

13. *Chrysochir aureus* (Richardson) (Fig. 8)

Head length 27-33%; second anal spine 5-8% of S.L.; dorsal rays 25-27; gas bladder round anteriorly with 24-26 arborescent tubules which are not divided into dorsal and ventral limbs; sagitta elongate with distinct anterior and posterior depressions, lower jaw with three pairs of mental pores; teeth well differentiated in both jaws; upper jaw with two pairs of canines; upper jaw overlaps lower; dorsal fin with, a grey blotch; opercle with a blue blotch. East coast of India, Malay Peninsula, Borneo, China.

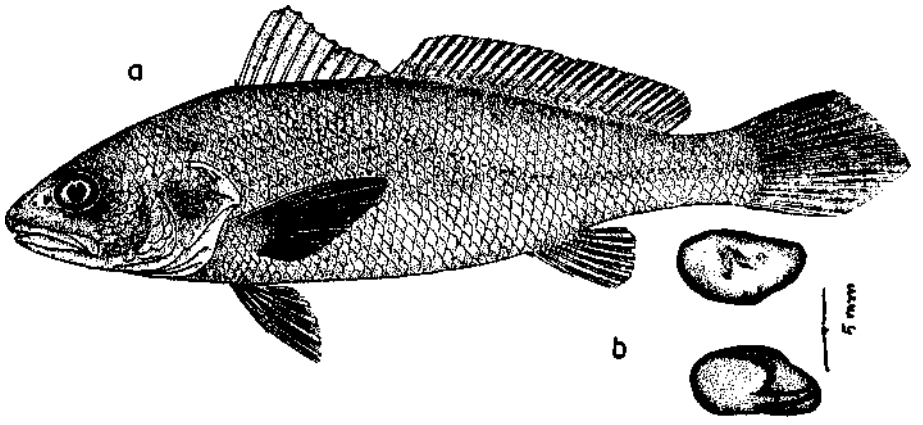


FIG. 8. (a) *Chrysochir aureus* (Richardson), T.L. 245 mm; (b) sagitta.

14. *Otolithes ruber* (Schneider) (Fig. 9)

Head length 29-34%; second anal spine length 4-6% of S.L.; dorsal rays 27-31; gas bladder round anteriorly with 30-38 pairs of branched tubules; sagitta elongate, anterior depression indistinct, the posterior depression expanded

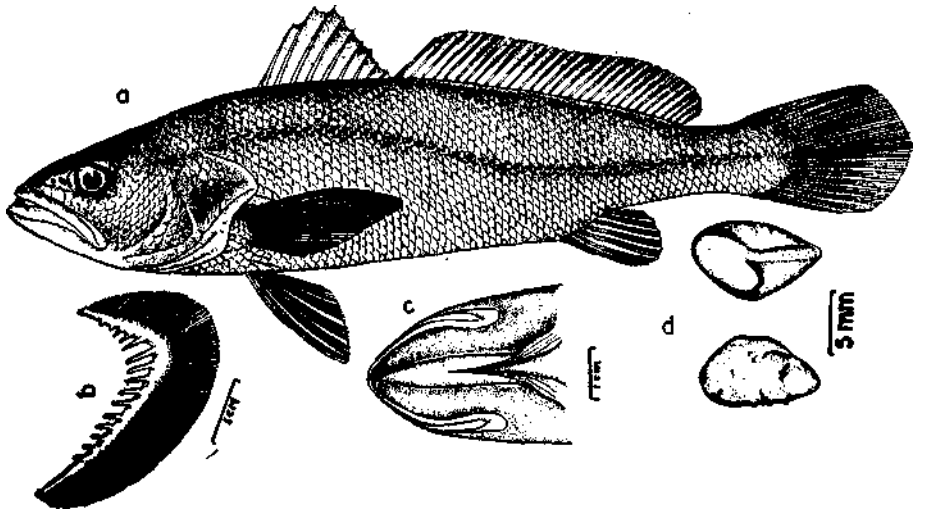


FIG. 9. (a) *Otolithes ruber* (Schneider), T.L. 215 mm; (b) gill arch; (c) ventral view of head; (d) sagitta.

and distinct; lower jaw with two pairs of mental pores; upper and lower jaw with well-developed strong canines and differentiated enlarged teeth posteriorly; mouth termial; gill rakers 8-11; body silvery, upper two-third of dorsal fin grey, opercle with a dark blotch. Bast coast of Africa, India, Indo-Australian Archipelago, Queensland, Philippines and Chinese seas.

15. *Otolithes cuvieri* Trewavas (Fig. 10)

Head length 32-33%; second anal spine length 5-7% of S.L.; dorsal rays 29-32; gas bladder round anteriorly with 25-28 pairs of arborescent tubules; sagitta elongate, anterior and posterior depressions shallow; lower jaw with two

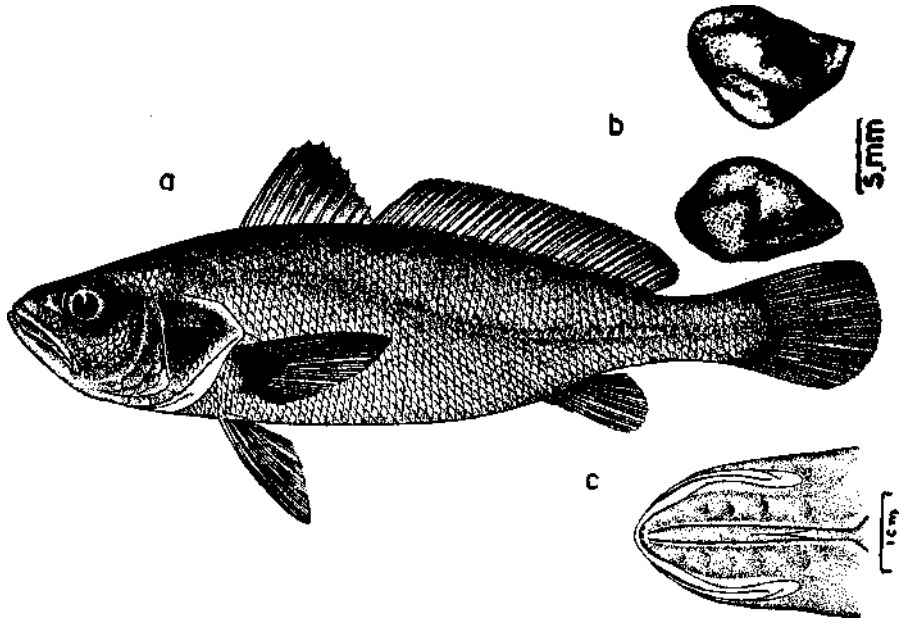


FIG. 10'. (a) *Otolithes cuvieri* Trewavas, T.L. 215 mm; (b) s gitta. (c) ventral view of head

pairs of mental pores; upper and lower jaw with canines, teeth well differentiated; mouth terminal; gill rakers 12-17 on lower limb of first arch; body silvery, axilla with a blue spot, opercle with a grey blotch. Coast of India and Pakistan.

16. *Pterotolithus maculatus* (Kuhl and Van Hasselt) (Fig. 11)

Head length 28-33%; second anal spine length 4-6% of S.-L,|»'dorsal rays 30-34; anal rays 10-12; gas bladder round anteriorly with 37-53 arborescent tubules with many branches covering the bladder dorsally; sagitta elongate, twice as long as wide, thin with a very faint anterior depression; lower jaw with a pair of mental pores; upper and lower jaws with well-developed canines; teeth well differentiated in jaws; mouth terminal; upper part of bqdy with 3-4 rows of dark blotches, dorsal fin also with blotches. North-east,vcoast of India, Burma, Malay Peninsula and Borneo.

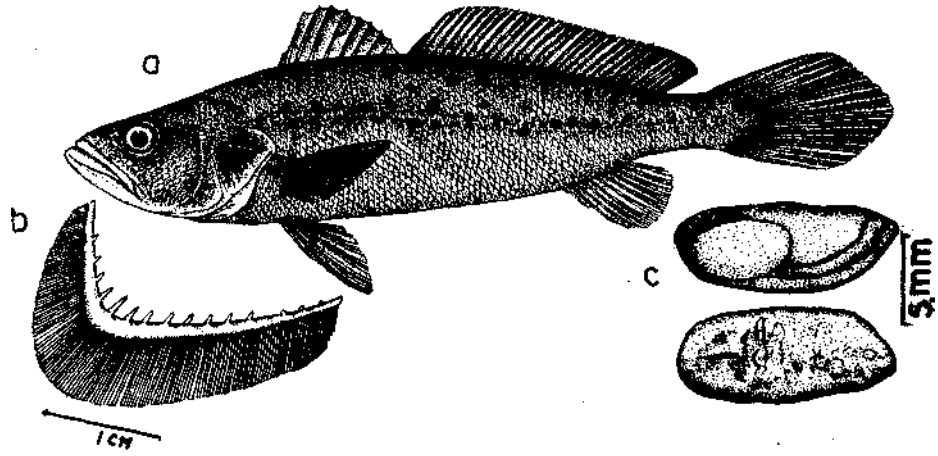


FIG. 11(a) *Pterotolitlms maculatus* (Kuhl & Van Hisselt), T.L. 180 mm; (b) gill arch; (c) sagitta.

17. *Protonibea diacanthus* (Lacepede) (Fig. 12)

Head length 30-33%; second anal spine length 9-11% of S.L.; dorsal rays 22-25; gas bladder round anteriorly with 19-20 pairs of arborescent tubules, anterior branches short; sagitta oblong, anterior depression distinct; three pairs of mental pores on lower jaw; teeth on upper and lower jaw, well differentiated;

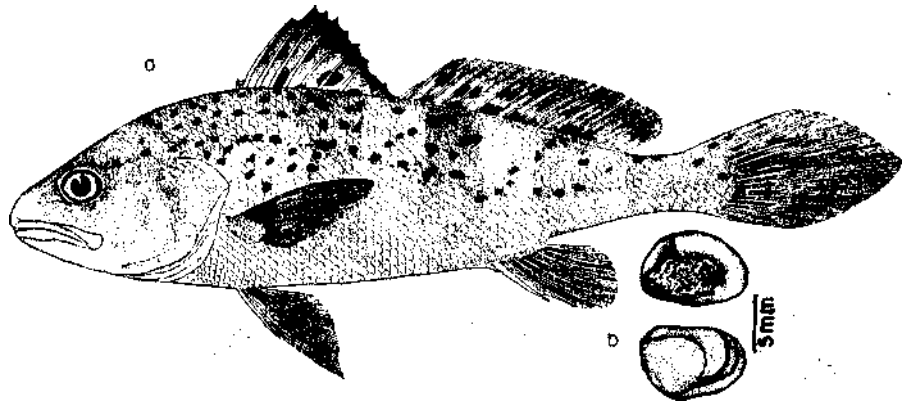


FIG. 12 (a) *Protonibea diacanthus* (Lacepede), T.L. 210 mm; (b) sagitta.

specimens below 280 mm have broad vertical bands and small blotches; in specimens above 400 mm, body hyaline. Gulf of Oman, India, Ceylon, Burma, Malay Peninsula, Thailand, Indonesia, Western Australia, Philippines, Chinese and Japanese waters.

18. *Dendrophysa russelli* (Cuvier) (Fig. 13)

Head length 28-33%; second anal spine length 12-17% of S.L.; dorsal rays 25-28; gas bladder round anteriorly with 15-17 short arborescent tubules;

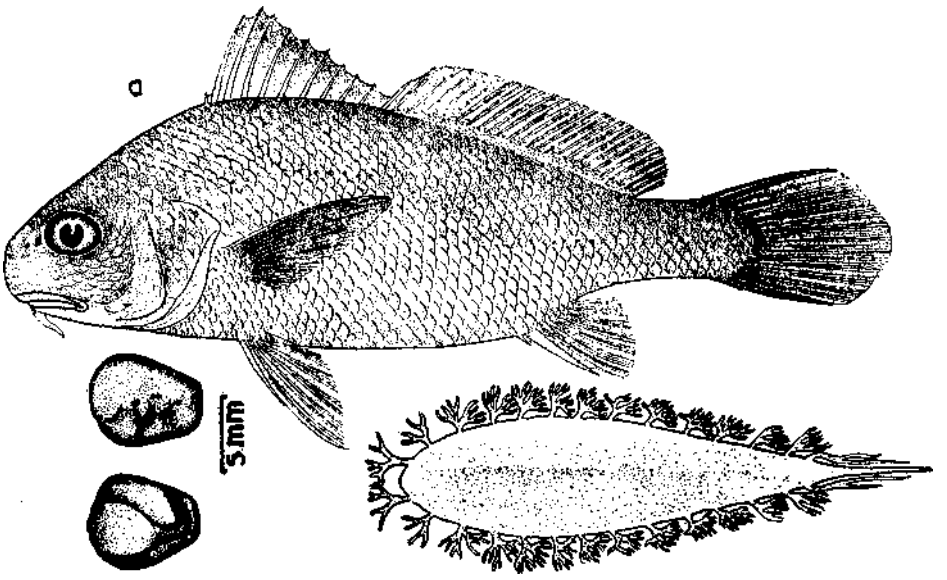


FIG. 13 (a) *Dendrophysa russelli* (Cuviei), T.L. 160 mm; (b) sagitta; (c) gas bladder.

sagitta broad anteriorly, anterior depression indinstinct; lower jaw with five mental pores; mental barbel filiform with a median mental pore at its base; mouth inferior; lower jaw with a band of villiform teeth. India, Malay Peninsula, East Indies, Philippines to China.

19. *Nibea semtluctuosa* (Cuvier) (Fig. 14)

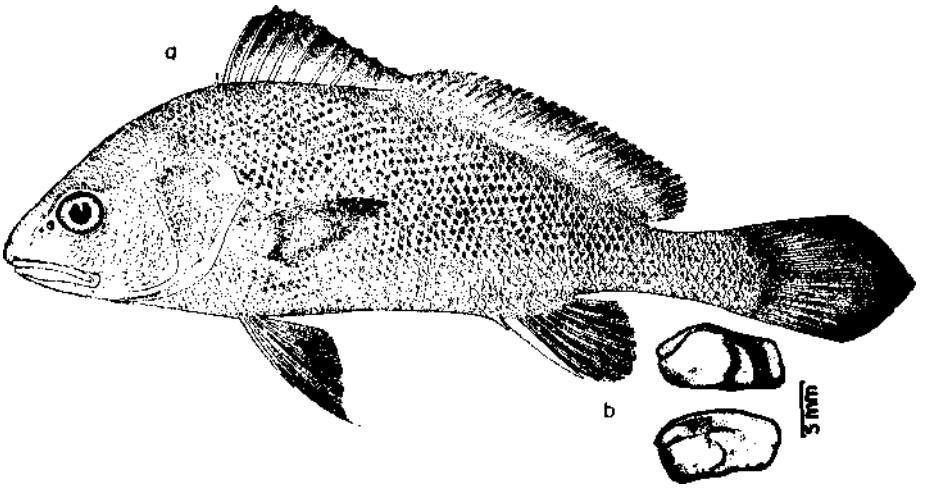


FIG. 14 (a) *Nibea semiluctuosa* (Cuvier), T. L. 217 mm; (b) sagitta

Head length 31-33%; second anal spine length 11-14% of S.L.; dorsal rays 28-29; gas bladder round anteriorly with 15-21 pairs of arborescent tubules; sagitta elongated with a shallow anterior depression and a distinct posterior groove; mental pores five; lower-jaw teeth well differentiated; rows of dark narrow strips on body, fins black. North-west coast of India and Mekaran coast.

20. *Nibea albida* (Cuvier) (Fig. 15)

Head length 28-31%; second anal spine length 13-15% of S.L.; dorsal rays 23-24; gas bladder round anteriorly with 18-19 arborescent tubules, first

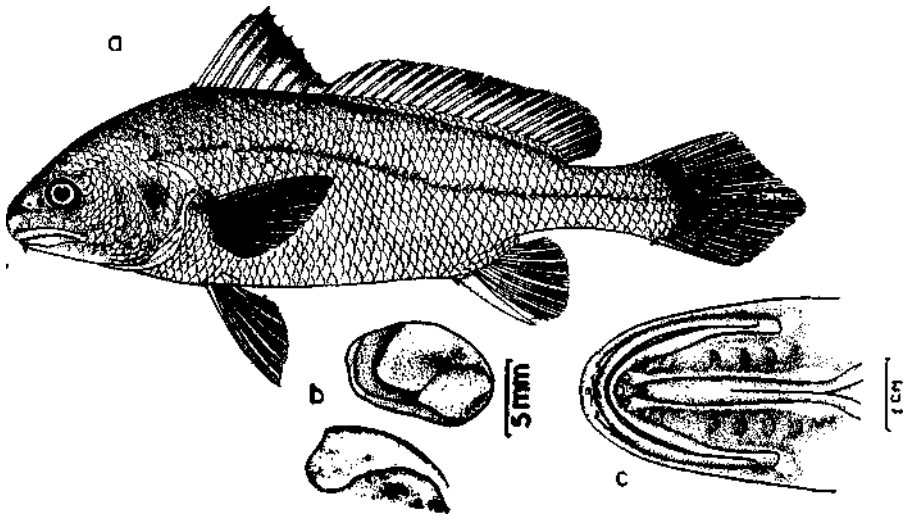
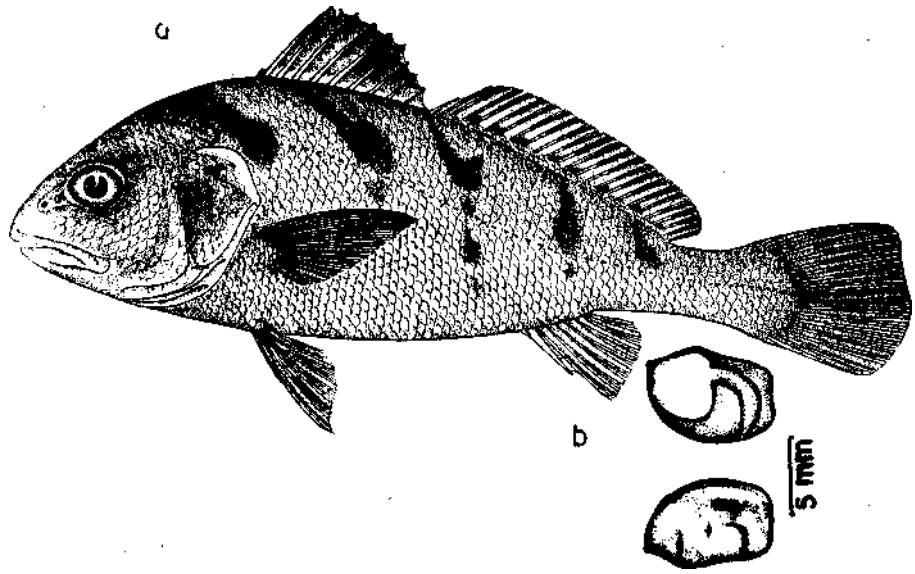


FIG. 15 (a) *Nibea albida* (Cuvier), T.L. 144 mm;
(b) sagitta; (c) ventral view of head.

tubule short; sagitta thick, anterior and posterior depression distinct; mental pores five; a pair of minute mental barbels on lower jaw; lower-jaw teeth differentiated; spinous dorsal black, body greyish. India - ascending estuaries and backwaters.

21. *Nibea maculata* (Schneider) (Fig. 16)

Head length 28-35%; second anal spine length 9-12% of S.L.; dorsal fin rays 22-26; gas bladder round anteriorly with 19-21 arborescent tubules on each side; first extending to base of cranium; sagitta broad with posterior groove sharply curved; five mentl pores on lower jaw; teeth differentiated in both jaws; mouth inferior; nape with a grey blotch expanding over opercle; body with four dark bands; upper spinous dorsal black. East and west coast of India, Sri Lanka.



PIG. **16** (a) *Nibea maculata* (Schneider), T.L. 230 mm; (b) sagitta.

22. *Nibea chui* Trewavas

Head length 31%; second anal spine length 13% of S.L.; dorsal rays 24; gas bladder round anteriorly with 18 pairs of aborescent tubules, first tubule extend to the head; sagitta broad with curved posterior groove; lower jaw with five mental pores; teeth well differentiated in both jaws; upper portion of spinous dorsal grey. Bombay, Hongkong, Amoy, Japan.

23. *Nibea soldado* (Lacepede) (Fig. 17)

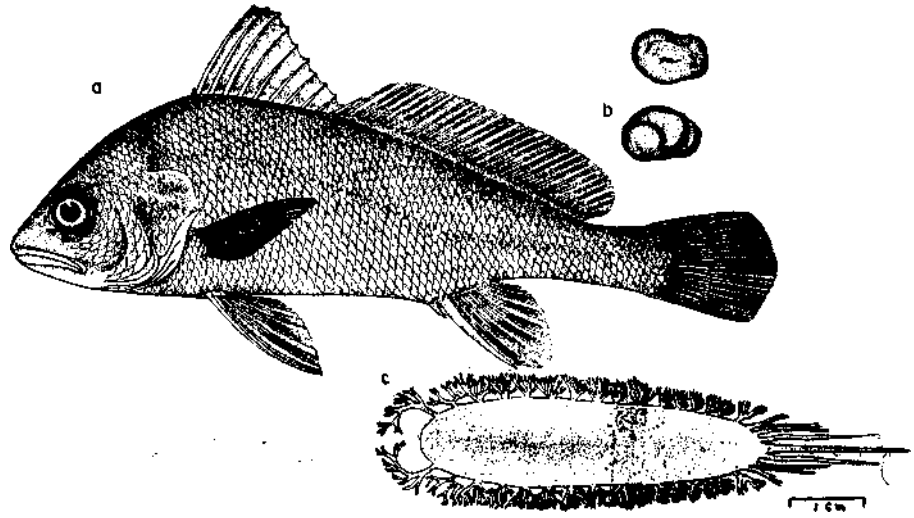


FIG. 17 (a) *Nibea soldado* (Lacepede), T.L. 205 mm; (b) sagitta; (c) gas bladder

Head length 26-32%; second anal spine length 14-18% of S.L.; dorsal rays 28-30; gas bladder anteriorly round with 20-22 short arborescent tubules, first tubule longer; sagitta elongated with anterior, distinct depression and posterior, curved deep groove; lower jaw with five mental pores; teeth differentiated in both jaws; a dark blotch on first dorsal, opercle with a blue blotch, base of each dorsal spine and rays with a spot. India, Sri Lanka, Malay Peninsula, Gulf of Siam, Indonesia, North Australia, Queensland.

24. *Johnius carutta* Bloch (Fig 18)

Head length 28-33%; second anal spine length 7-12% of S.L.; dorsal rays 27-30; gas bladder with anterio-lateral expansion with 15-16 arborescent tubules, inner branch of first tubule extends to head, whereas its lateral branch

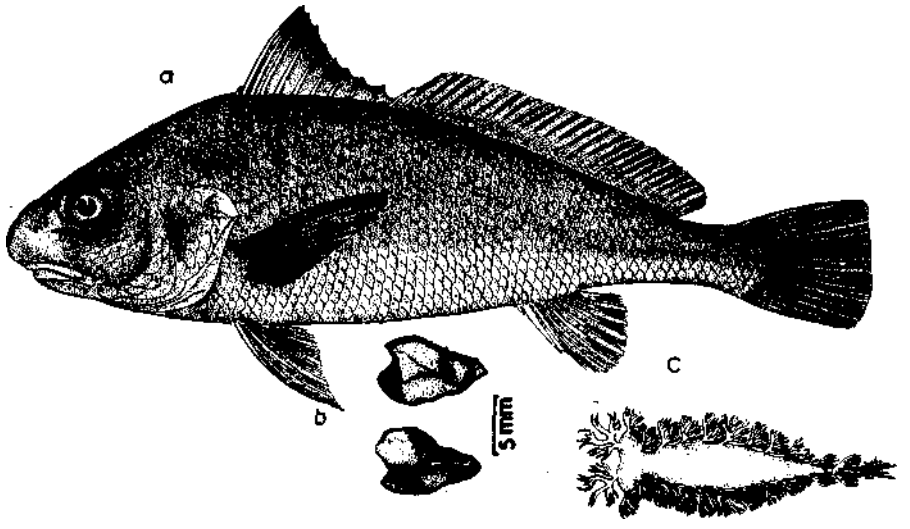
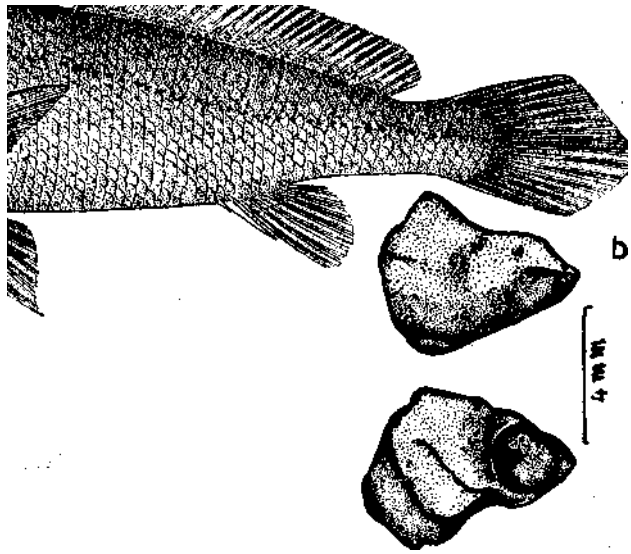


FIG. 18 (a) *Johnius carutta* Bloch, T.L. 190 mm; (b) sagitta; (c) gas bladder.

extends to opercular opening; sagitta very thick, the anterior depression distinct and posterior groove deep; mental pores three pairs; teeth villiform in lower jaw; lateral line silvery, caudal fin nearly truncate; body deep grey. India and Thailand.

25. *Johnius elongatus* Mohan (Fig. 19)

Head length 25-32%; anal spine length 6-9% of S.L.; second dorsal rays 25-29; gas bladder with anterio-lateral expansion with 15 tubules, first tubule well developed and extends to head and exterior; sagitta thick, anterior half enlarged, posterior groove deep (johnius type); mental pores five; a pair of minute barbel-like knobs at inner mental pores; teeth on lower jaw uniformly villiform; mouth inferior; dorsally grey, upper spinous dorsal grey. West coast of India.



FUG. 19 (a) *Johiuus elongatiis* Mohan, T.L. 153 mm; (to) sagittta

26. *Johnius belangerii* (Cuvier) (Fig. 20)

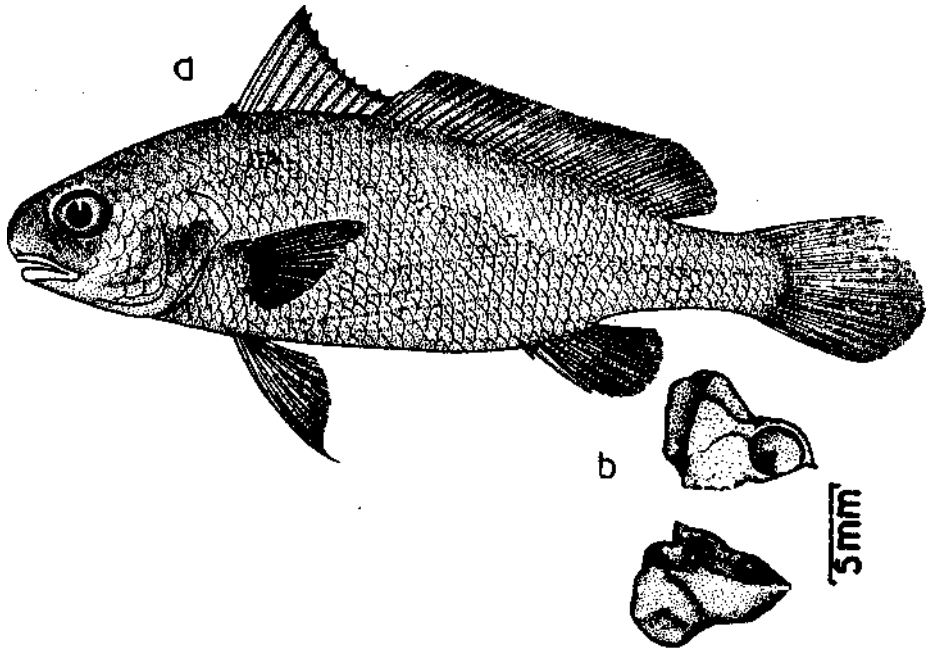


FIG. 20 (a) *Johnius belangerii* (Cuvier), T.L. 185 mm; (b) sagitta.

Head length 27-33%; second anal spine length 7-12% of S.L.; dorsal rays 27-31; gas bladder 'Johnius type'; sagitta 'johnius type'; mental pores five; lower jaw with uniform villiform teeth; mouth inferior, lips rather thick; ventral fin black, body grey to dark grey. Natal, India, East Indies, China.

27. *Johnius dussumieri* (Valenciennes) (Fig. 21)

Head length 29-33%; second anal spine length 7-11% of S.L.; dorsal rays 23-26; gas bladder with anterio-lateral expansion, arborescent tubules

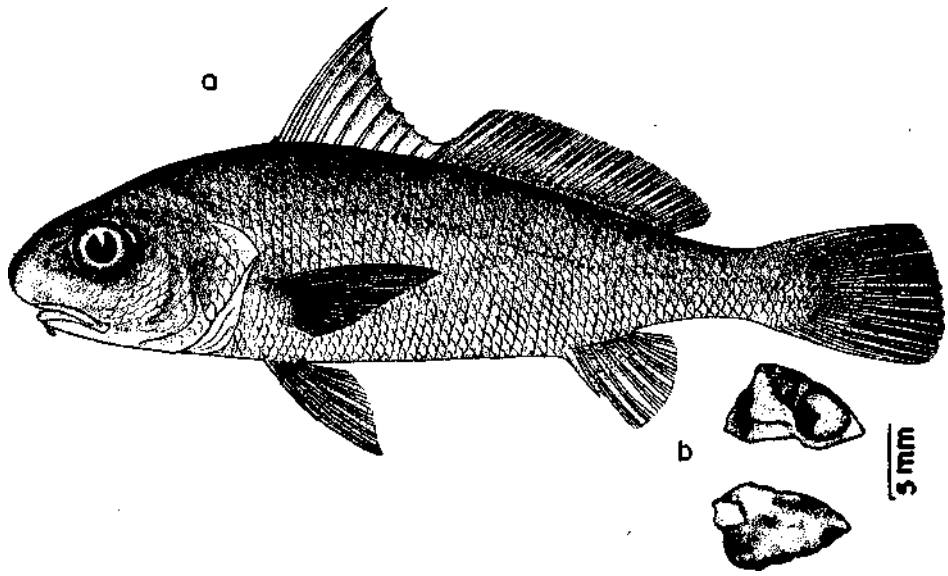


FIG. 21 (a) *Johnius dussumieri* (Valenciennes), T.L. 166 mm; (b) sagitta.

14-15; sagitta 'Johnius type'; mental pores five; median mental pore at the base of a solid barbel; scales on body and head cycloid; lower jaw with uniform villiform teeth; second and third dorsal spines elongate, filiform (56-86% of head); first dorsal dark grey. Natal, Mekaran coast, India, East Indies* Philippines and China, South-western Japan.

28. *Johnius mannarensis* Mohan (Fig. 22)

Head length 29-31% of S.L.; second anal spine length 29-34% of head length; dorsal rays 27; gas bladder 'Johnius type' with lateral expansion, with 13-15 arborescent tubules; sagitta 'Johnius type'; mental pores five, mental barbel stout, median mental pore at its base; lower jaw with villiform teeth; scale ctenoid on body; second and third dorsal spines not elongated; first dorsal fin grey. Pamban (Gulf of iMannar).)

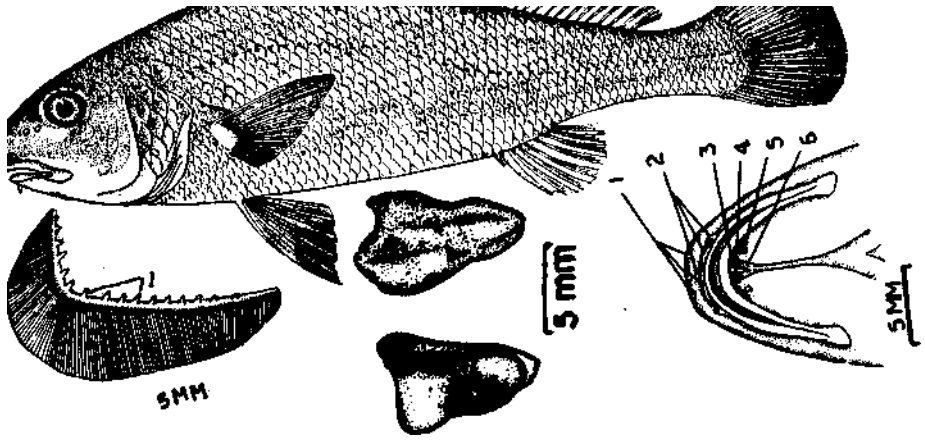


FIG. 22 (a) *Johnius mannaretisis* Mohan, T.L. 195 mm; (b) gill arch; (c) saigitta; (d) ventral view of head - *I.* basal pores, 2. marginal pores, 3. median mental pore, 4. inner mental pore, 5. outer mental pore, 6. mental barbel.

29. *Johnius cottor* (Hamilton) (Fig. 23)

Head length 25-28%; length of second anal spine 11-14% of S.L.; soft dorsal rays 25-29; gas bladder 'Johnius type' with anterio-lateral expansion and 10-13 pairs of lateral arborescent tubules; sagitta 'johnius type' mental pores five

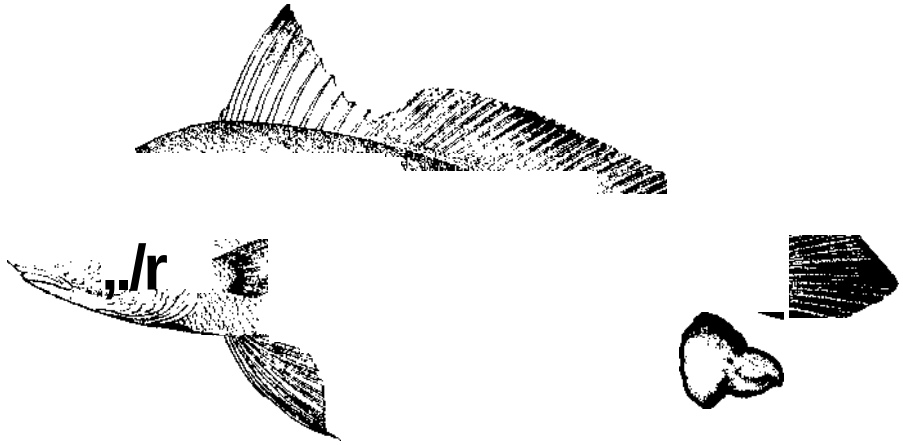
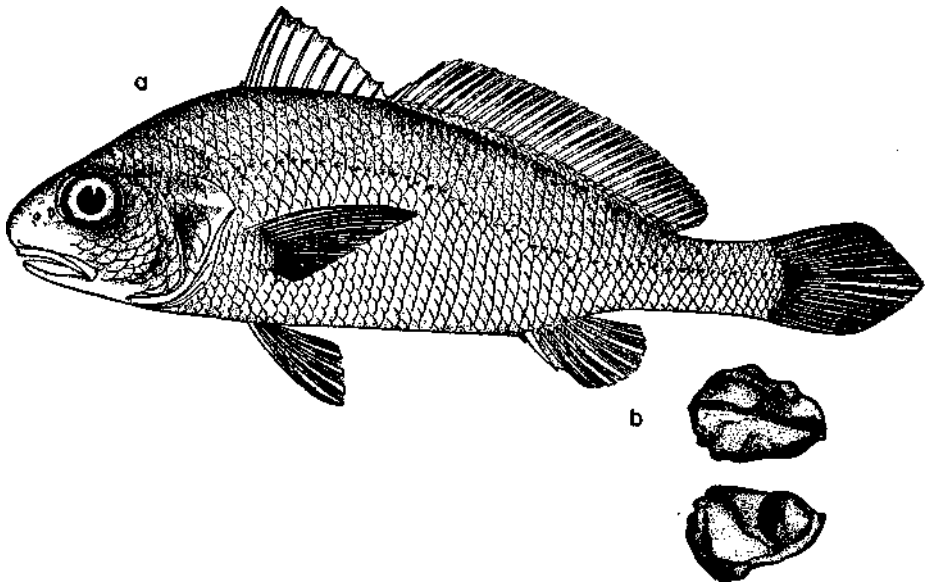


FIG. 23 (a) *Johnius coUor* (Hamilton), T. L. 1W mm; (b) sagitta.

on lower jaw; median mental pore with a fleshy pad; lower-jaw teeth villiform, uniform or slightly enlarged; mouth inferior; anal spine robust, pointed (43-56% of head); eye small (23-31% of head); opercle with a blue blotch, dorsal light grey. Estuaries and coast of India, Indo-Australian Archipelago, east coast of Australia. Forms a fishery in Sunderbans (Bengal).

30. *Johnius glaucus* (Day) (Fig. 24)

Head length 25-32%; second anal spine length 8-10% of S.L.; soft dorsal rays 28-30; gas bladder 'Johnius type' with anterio-lateral expansion and 14-15 lateral arborescent tubules; sagitta 'Johnius type'; mental pores five on



'FIG. 24 (a) *Johnius glaucus* (Day), T.L. 196 mm; (b) sagitta.

lower jaw; lower jaw with villifprm teeth; eyes large (24 to 30% of head); mouth slightly oblique; upper two-third of spinous dorsal black, branchial cavity black. North west coast of India. Form a fishery in Bombay and Veraval.

31. *Johnius macropterus* (Bleeker) (Fig. 25)

Head length 24-29%; second anal spine length 8-11% of S.L.; dorsal rays 30-34; gas bladder 'Johnius type' with anterio-lateral expensions and 15-16 arborescent tubules; sagitta stout, 'Johnius type'; lower jaw with five mental pores, the median mental pore at the base of a minute filiform mental barbel; lower jaw with uniform villiform teeth; body with deciduous, ctenoid scales; spinous dorsal ray not elongated; body dark grey, spinous dorsal grey. Natal, India, Ceylon, Indo-Australian Archipelago, New Guinea.

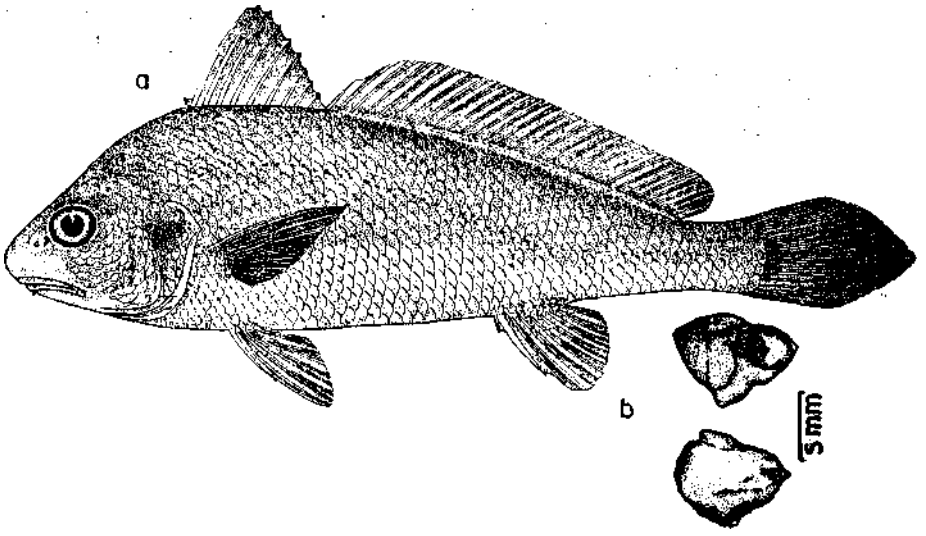


FIG. 25 (a) *Johnius macropterus* ('Sleeker), T.L. 133 mm; (b) sagitta.

32. *Johrueops macrorhynus* Mohan (Fig. 26)

Head length 24-29%; second anal spine length 6-10% of S.L.; dorsal rays 26-30; gas bladder with anterio-lateral expansion, 'johnius type' with 13-14 pairs of arborescent tubules; inner branch of first tubule extends to head and

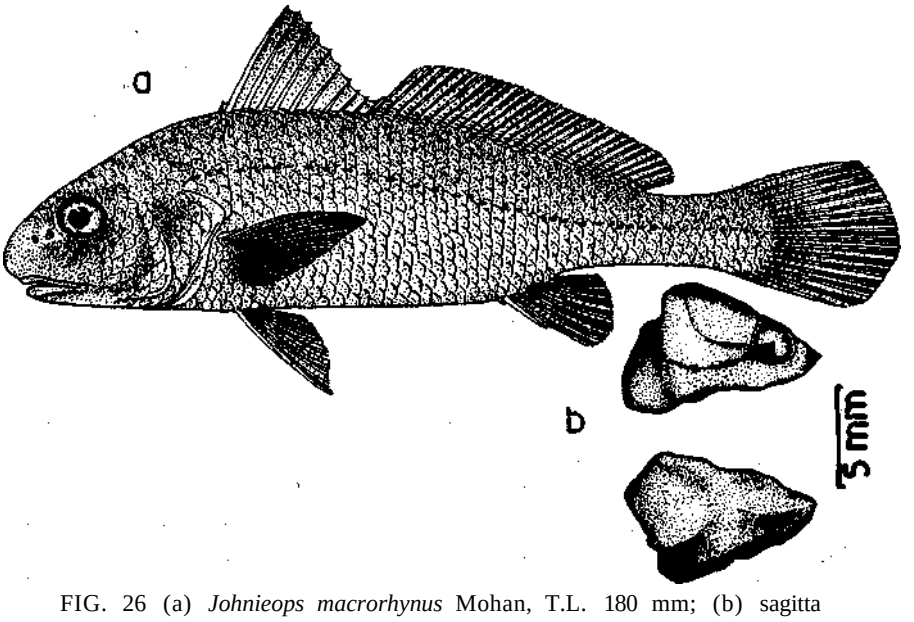


FIG. 26 (a) *Johnieops macrorhynus* Mohan, T.L. 180 mm; (b) sagitta

outer branch extends to exterior through the opercular wall near the junction of deithrum and supracleithrum; sagitta 'johnius type' with faint anterior depression and a deep posterior groove, sagitta thick;.lower jaw inferior; lower jaw with inner row of slightly enlarged or molariformed teeth; pale brown dorsally, yellowish ventrally. India, Aridamans, Singapore.

33. *Johrieops aneus* (Bloch) (Fig. 27)

Head length 28-33%; second anal spine length 8-12% of S.L.; soft dorsal rays 25-30; gas bladder 'johnius type' with lateral expansion and 13-14 arborescent tubules; sagitta 'johnius type'; lower jaw with five mental pores;

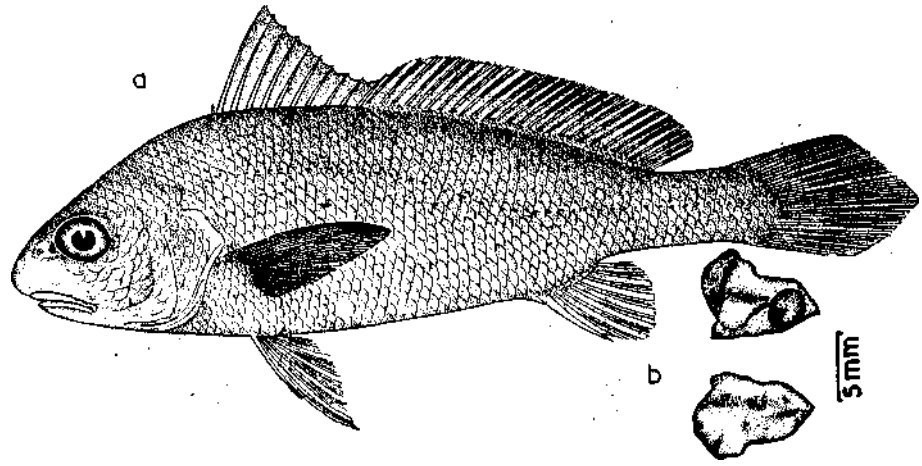


FIG. 27 (a) *Johnieaps aneus* (Bloch), T.L. 130 mm; (b) sagitta

inner row of lower-jaw teeth enlarged and the outer row villiform; snout slightly projects beyond upper jaw; Arts dorsal black, opercle with a steel blue blotch. Persian Gulf, India, Ceylon. Forms a fishery in Gulf of Mannar.

34. *Johrueops dussumieri* (Cuvier) (Fig. 28)

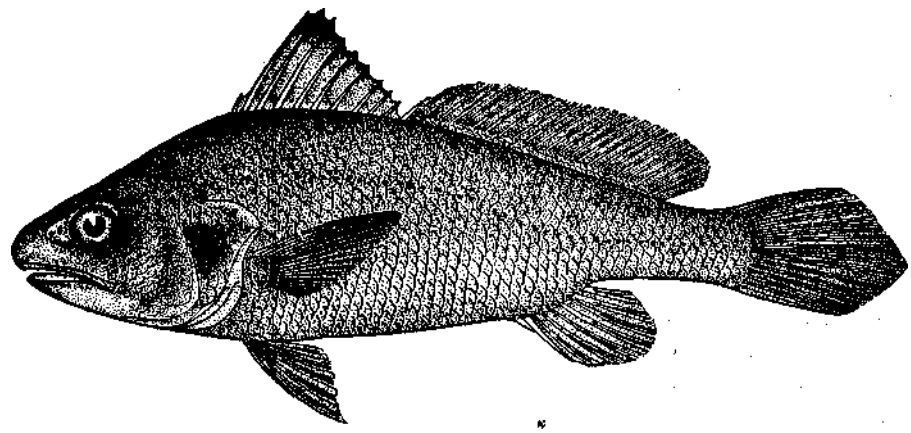


FIG 28. *Johnieops dussumieri* (Cuvier), T.L. 146 mm.

Head length 29-32%; second anal spine length 7-11% of S.L.; soft dorsal 25-29; gas bladder 'johnius type' with anterio-lateral expansion and 14 arborescent tubules; sagitta 'johnius type'; lower jaw with 6 mental pores; lower jaw with enlarged teeth; caudal fin cunate; mouth subterminal; snout slightly projects beyond upper jaw; first dorsal black, opercle with steel blue blotch. East coast of Africa, India. Forms a fishery in south-west and south-east coasts of India.

35. *Johrneops sina* (Cuvier) (Fig. 29)

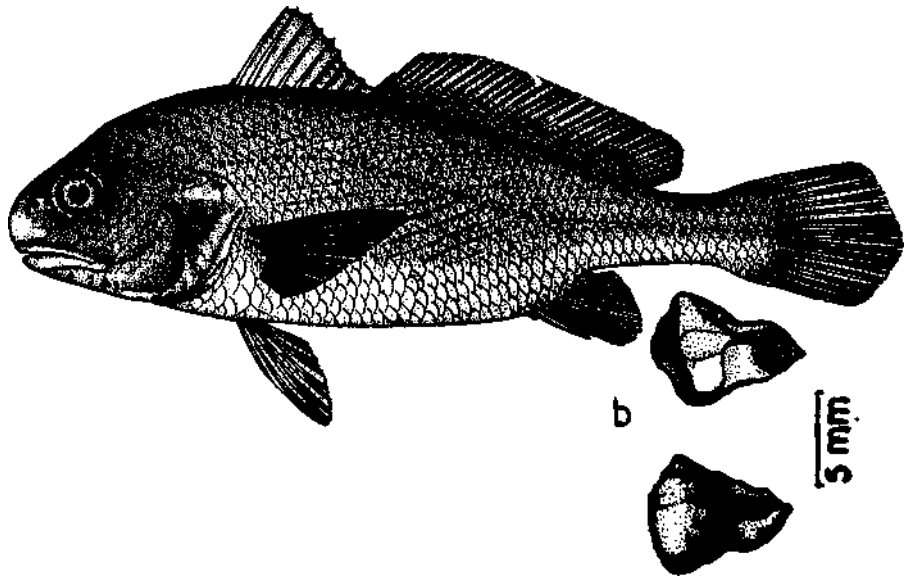
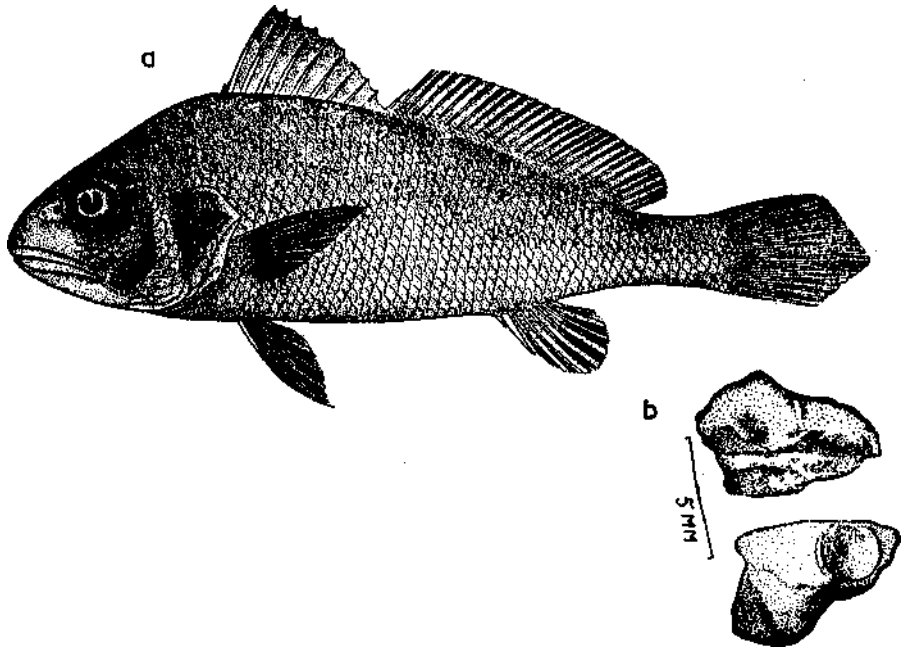


FIG. 29 (a) *Johnieaps sina* (Qivier), T.L. 1&5 nun; (b) sagitta

Head length 29-35%; second anal spine length 4-9% of S.L.; soft dorsal rays 26-31; gas bladder 'johnius type' with anterio-lateral expansion and 15-16 arborescent tubules; sagitta 'johnius type'; mental pores three pairs, without fleshy pad; lower jaw with differentiated teeth; mouth terminal, cleft of mouth oblique; upper two-third of spinous dorsal and opercle with a steel blue blotch. From Natal to Malay Peninsula, Indo-Australian Archipelago.

36. *Johnieaps vogleri* (Bleeker) (Fig. 30)

Head length 31-34%; second anal spine length 7-10% of S.L.; soft dorsal rays 26-31; gas bladder 'johnius type' with anterio-lateral expansion and 14 arborescent tubules; sagitta 'johnius type'; mental pores six; no fleshy pad around the pores; mouth terminal; lower jaw with well-differentiated teeth with enlarged inner row; upper jaw with a pair of enlarged teeth; mouth oblique; upper two-third of first dorsal grey. India, Indo-Australian Archipelago, Australia; Philippines, Thailand. Forms a fishery *'m* north west coast of India.



FKJ. 30 (a) *Johmeops vogleri* (Bleeker), T.L. 167 mm; (b) sagitta

KEY TO THE FISHES OF THE FAMILY SCIAENIDAE OF INDIA

1. a) Gas bladder with more than 15 pairs of arborescent tubules. 2
   b) Gas bladder without or less than 3 pairs of tubules. 30

2. a) Gas bladder hammer-shaped, outer branch of first arborescent tubule communicate with outside through branchial cavity above the siupracleithrum, mouth inferior, lower jaw pores well developed, lower jaw with or without barbels. 3

   b) Gas bladder carrot-shaped, outer branch of first tubule does not communicate outside through branchial cavity, barbels may or may not be present. 15

3. a) Lower jaw with uniform band of villiform teeth, mouth inferior. 4

   b) 'Lower jaw with differentiated teeth, mouth inferior or sub equal, mental barbel absent. 12

4. a) Lower jaw with mental barbel. 5
   b) Lower jaw without mental bsirbel. 7

5. a) iBody with cycloid scales, second dorsal rays 23-26, second and third dorsal spines elongated, mental barbel 33-45% of eye. . . . . *Jokmus dusswnieri*

   b) Body with ctenoid scales **6**

a) Second dorsal rays 30-34; mental barbel thin, 12-16% of eye . . . . . *Johnius mctcropterus*

b) Second dorsal rays 27; mental barbels solid, 20-27% of eye . . . . . *Johnius mannarensis*

a) Lateral line with a white streak, dorsal rays 27-<30; Or. 6-9/13-16 . . . . . *Johnius carutta*

b) Lateral line without a white streak 8

a) Anal spine strong, 43-56% of head, dorsal rays 25-27; Ltr. 7*8/12-14: depth of body 24-29% of standard length . . . . . *Johnius coitor*

b) Ami spine moderate or weak, less than 40% of head 9

a) Body dark grey, tip of pelvic fins black, lower lips well developed, second anal spine moderate, 30-39% of head; Ltr. 8-9/1/12*15 . . . . . *Johnius belangerii*

b) Anal spine weak 11

a) Second anal spine 19-32% of head; eye 18-27% of HL. Second dorsal spine 50-62%, lower arch gill raker 6-7 . . . . . *Johnius elongatus*

b) Second anal spine 26-32% of bead; eye 24-30% of head; Second dorsal spine 43-47%, lower arch gill rakers 9-12 . . . . . *Johnius glaucus*

a) Lower jaw teeth moderately or slightly enlarged, mouth subterminal or inferior- • • 12

b) Lower jaw teeth well developed and spaced, mouth terminal, anterior upper jaw teeth well developed . . . . . *Johnieops vogleri*

a) (Month sub-terminal lower jaw teeth moderately developed, lower jaiw 40-50% in head, lower arch gill rakers 10-15 . . . . . *Johnieops sina*

b) cleft of mouth oblique, lower jaw teeth weak, slightly enlarged 13

a) Gil rakers 14-16 on lower arch, lower jaw 30-41% of head; second anal spine 24-36% of head; eye 17-26% of head . . . . . *Johnieops dussumieri*

b) Gill rakers on lower arch 5-13; mouth oblique or inferior, lower jaw teeth slightly enlarged or molariformed posteriorly 14

a) Gill rakers on lower arch 10-13; mouth oblique; lower jaw 26-36% of head; teeth on lower jaw weak, slightly enlarged; eye 22-26% of head; second anal spine 29-36% or head . . . . . *Johnieops aneus*

b) Gill rakers on lower arch 5^8; mouth inferior, lower jaw 24-31% of head; eye 20-26% of head; second anal spine 21-31% of head; inner row of teeth on lower jaw molariform; . . . . . *Johnieops macrorhynus*

a) Canine teeth present 16

b) Canine teeth absent 19

a) Canine teeth on upper and lower jaws 17

b) Canine teeth on upper jaw alone, mouth inferior; dorsal rays 25-26; mental pores 6, gas bladder with 25 well developed arborescent tubules. . . .*Chrysochir aureus*

17. a) Aanal fins with 10-.11 revs. . . . . .*Pterotolithes maculatus*

b) Anal fins rays 7. 18

18. a) Gill rakers 13 on lower arch, eye 20-22% of head; arborescent tubules 28; lower canines 18-27% of eye. . . . . .*Otolithescuvieri*

b) Gill rakers 8-10 on lower arch, eye 15-20% of head; lower canines 28-55% of eye; arborescent tubules 36-38. . . . . .*Otolithes ruber*

19. a) Lower jaw with one or two mental barbels. 20

b) Lower jaw without mental barbels. 21

20. a) Mental barbel 62-80% of eye; lower jaw teeth villiform, anal spine stroag, 38-57% of head. . . . . *Dendrophysa russelli*

b) Two minute mental barbels; dorsal rays 23-24, anal spine strong 45-52% of head . . . . . *Nibea albida*

21. a) Body with dark bands, Streaks or spots. 22

b) Body without bands or streaks. 24

22. a) Dorsal rays 22-26 23

b) Dorsal rays 28-29; second ana] spine 37-45% of head, arborescent tubules 15-21; Lateral transverse scales 12il3/19-20. . . . . .*Nibea semiluctuosa*

23. a) iBody with 5 bands; lateral transverse scales '11-13/1/17-21; caudal fin biconcave mouth inferior. . . . . *Nibea maculata*

b) Body with bands and spots in juveniles only (Adults without bands or spots); dorsal rays 22-25; lateral transverse scales 9-12/1/15-17; caudal fin cunate; mouth sub-terminal. . . . . *Protonibea diacanthus*

24. a) Anal spine strong, more than 40% of head length. 25

b) Anal spine less than 40% of head length. 26

25. a) Dorsal rays 24-25; second anal spine 42% of head, gill rakers on lower arch 13; arborescent tubules 18;. . . . . *Nibea chui*

b) Dorsal rays 28-30; second anal spine 46.0-60.0% of head; gill rakers on lower arch 8-10; arborescent tubules 20-22. . . . . *Nibea Soldado*

26. a) Caudal fin truncate dorsal rays 21-26; eye 2)1-25% of head; second anal spine 19-29% of head; lateral transverse scale 7^10/1/12-14 *Pennakia macrophthalmus*

b) Caudal fin biconcave or cunate or rhomboid;. 27

27. a) Caudal fta biconcave; arborescent tubules 25-35; gill rakers 3-6/1/8-10; dorsal rays 26-29. . . . . *Argyrosomus hotolepidotes*

to) Caudal fin rhomboid or cunate 28

a) Caudal fin rhomboid, mental pores 3 pairs, gill rakers 5 + 1 + 8; dorsal rays 27; arborescent tubules short, about 29 pairs; Ltr. 9-10/1/18 . . . . . *Argyrosomus amoyensis*

b) Caudal fin cunate 29

a) Dorsal rays 27-28; gill ra<kers 7-4$/l/ll-(12; arborescent tubules long, well developed, 25-28; head 32-35% of SL; gill .filaments 36-42 of eye, upper jaw length 47-48% of SL. . . . . *Atrobucca robe*

b) Dorsal rays 24-26; gill rakers 6/1/10; head 37-40% of SL; longest gill filaments 71-90% of eye; length of upper jaw 37-41 of SL. . .. *Atrobucca trewavasae*

a) Gas bladder without arborescent tubules, second dorsal rays 27-29; scales ctenoid, body with narrow oblique band's. . . . . *Umbrina sinuata*

b) GES bladder with 1-2 pairs of anterior or posterior tubules. 31

a) Gas bladder with 1-2 pairs of anterior tubules. 32

b) Gas bladder with one pair of posterior tubules which extends anteriorly ramifying at the base of skull. 33

a) Gas bladder with one pair of anterior tubules. 34

b) Gts bladder with 2 pairs of short tubules, second anal spine strong; 54-63% of head length. Ltr. 8-10/11-12; body with oblique dark bands ...*Macrospinosa cuja*

a) Dorsal rays 28-29; gill rakers 5/l/10-ill; longest gill raker 33-35% of eye; Ltr, 18-20/1/19-20. . . . . *Otolithoides biaurfles*

b) Dorsal rays 40-45; gill rakers 5-7/1/10-13; longest gill raker 66-110% of eye; Ltr. 15/1/16-20. . . . . *Otolithoides pama*

a) The anterior tubules long and ramify below skull; dorsal rays 31-35; gill rakers 5-6/1/10-12; lateral transverse scales 12-15/13-16. . . . . *Panna microdon*

b) Gas bladder tubules short, and do not ramify. 35

a) Gas bladder tubules extend anteriorly; gill rakers 9-11/19-22; dorsal rays 26-29; second anal spine 33-44% of head; axilla with a well developed blotch . . . . . *Kathala axillaris*

b) Gas bladder tubules extend posteriorly; gill rakers 4-5/1/7-8; Ltr. 9-10/1/20; dorsal rays 24-26; second anal spine 46-50% of head length. . . . . *Bahaba chaptis*